

REMARKS

In response to the September 19, 2005 Office Action, Applicants respond to the Examiner's detailed action with the following remarks numbered according to the Examiner's communication.

1-4. Applicants respond to the Claim Objections to Claims 20 and 22-23. Applicants have amended Claim 20 to read that the highly conductive material is reacted from a metal and the semiconductor substrate. Moreover, Applicants have cancelled Claim 22 without prejudice, and amended Claim 23 to properly note that it depends from either Claims 20 or 21. As such, Claims 20 and 23 are now in condition for allowance.

5. Responsive to Examiner's rejection of the Replacement Drawings, Applicants request clarification of the rejection of the drawings, and specific mention as what new matter is introduced through the Replacement Drawings. The Replacement Drawings merely correct the previous drawings to accurately reflect what is written in the specification.

The specification states:

Turning to FIG. 6, the screen oxide layer 125 is removed and a metal layer 220 of platinum or titanium is deposited on the upper surface of the epitaxial layer 124. The metal layer 220 is heated to 650.degree. C. and then to 850.degree. C. to form a highly conductive silicide layer on the surface of the source regions 114. The metal reacts with the underlying silicon in the epitaxial layer to form a metal silicide 225. **That layer is also formed over the surface of the polysilicon 112 in the trench. The metal does not react with the oxide 116 on the trench wall.** The unreacted metal 220 is removed by an etch step that leaves the silicide layer 225 but removes the unreacted metal 220. The surface portion of the polysilicon in the trenches is also silicided. Those skilled in the art may use one or more processes and other metals for forming the silicide layer 225. The conductive silicide layer reduces the RDSON resistance of the source region. Because silicide it is highly conductive, only a relatively small area of the silicided source region is needed to provide a reliable electrical contact. As such, one may cover the entire surface of the epitaxial layer with an insulating material and open vias in the insulating material to contact the silicide layer 225.

Emphasis added.

The previous drawings showed a continuous layer over the source, as opposed to correctly showing, as described in the specification, the ends of the trench oxide as being exposed. The Replacement Drawings show the silicide layer over the source and the trench polysilicon but not over the end of the trench insulating layer at the top of the trench adjacent to the source, as described in the above passage from the Specification. Accordingly, no new matter is introduced with the Replacement Drawings, and therefore, are acceptable.

Responsive to Examiner's rejection of Claims 24-26 under 35 U.S.C. 112, second paragraph, Applicants have amended Claims 24-26 to remove "source" from the claims. The claims now read "the highly conductive layer," thereby addressing the issue of insufficient antecedent basis. Accordingly, Applicants believe Claims 24-26 are now in condition for allowance.

6. Responsive to Examiner's rejection of Claims 14 and 21 – 24 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,881,105 (Davari et al.), Applicants respectfully traverse Examiner's rejection. Claims 21-24 depend from Claim 14, and thereby Claims 21-24 incorporate each and every element and limitation of the claim from which they depend. Applicants have amended Claim 14 to add: "a single drain region on the other surface of the semiconductor substrate;" and "an insulating layer on the highly conductive layer and on the conductive material in the trenches." No new matter is added with this amendment.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The device taught by Davari et al. does not include an insulating layer formed over the highly conductive layer and the trenches. A semiconductor device with an insulating layer formed over the trenches is more robust during processing and is less sensitive to etching errors, because only small portions of the highly conductive layer are exposed. Any gate-to-source leak and capacitance is also reduced. Further, the highly conductive layer is formed over the trenches. The highly conductive layer produces the

advantage of reducing RDS_{ON} resistance of the source region. Lastly, the semiconductor device has only one drain that spans the entire surface opposing the source layer.

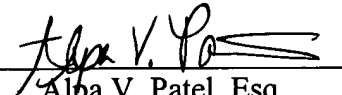
The reference does not anticipate the Claim 14 or any of its dependent claims. Davari et al. clearly do not teach the element of forming the insulating layer over the trenches. In fact, the metal used to fill the trenches are exposed over the insulating layer (*See* Fig. 1; Col. 4, Lines 30-42). Furthermore, Davari et al. do not teach the use of a highly conductive layer formed over the filled trenches. Rather Davari et al. teach the source region as being buried in the device. Applicants claim two conductive elements in the trench, polysilicon and a silicide on top of the polysilicon. Davari et al. teaches only one conductive element in the trench, not two conductive elements as claimed in the present invention. Also, Davari et al. teach the use of many small drain regions, not the use of one drain region. The drain regions in the reference are also all in close proximity to the source and gate region, where as the claimed device has the drain region being on the opposite surface of the source layer. As such, Davari et al. cannot properly anticipate Claim 14 or its dependent claims because the reference does not teach each and every element as set forth in the claim. Applicants believe that the Claims 14 and 21-24 are now also in condition for allowance.

7-10. Applicants appreciate the opportunity to call the Examiner but believe that this amendment to the claims and the forgoing remarks fully address the issues raised by the Examiner. On the other hand, the Examiner is invited to call the undersigned attorney if he has any matters to address that will facilitate allowance of the application.

Filed with this amendment and response is a petition to extend the time to answer and a request for continued examination together with the applicable fee to be paid from Deposit Account No.: 50-3010. Applicants respectfully request favorable consideration and the timely issuance of a Notice of Allowance in this case.

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